

Title	VRを用いたスピーチ練習における仮想聴衆の人数と発表者の心理的負荷の関係
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Citation	
Issue Date	2025-03
Type	Thesis or Dissertation
Text version	author
URL	<a href="http://hdl.handle.net/10119/19720">http://hdl.handle.net/10119/19720</a>
Rights	
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# **Relationship between the number of virtual audience members and psychological load of presenters in public speaking practice using VR**

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In this study, three hypotheses were formulated and tested regarding the relationship between the number of virtual audience members and the psychological load of speech presenters. We investigated the psychological load of the presenters based on subjective questionnaires during the experiment, biometric data during speech practice, and self- and peer-ratings during the speech performance.

Public speaking is an important skill today. However, public speaking tends to cause tension. To reduce the psychological burden of public speaking, research on speech support using VR has been conducted since the development of the head-mounted display, and VR-based speech support research has the advantage that the environment can be freely changed. However, the influence and effect of such environmental factors have not been fully clarified. In particular, the relationship between the number of audience members and the psychological load of the speech presenter has not yet been clarified, although it has been verified for audience attitude.

For these reasons, this study aimed to elucidate the relationship between the number of virtual audience members and the psychological load of speech presenters, and three hypotheses were formulated.

**【I】 Subjective psychological load increases linearly with the number of virtual audience members after the experimental stimuli.**

**【II】 Physiological responses during speech practice showed an increasing trend over time, and its slope increased with the increase of the number of virtual audience members.**

**【III】 Subjective and objective ratings to public speaking will become lower as the number of virtual audience members increases during the speech performance.**

We attempted to achieve those objectives by testing the above three hypotheses.

A preliminary experiment was conducted prior to the main experiment. The first was to quantitatively evaluate whether the presence or absence of a virtual audience influenced the presenter. Second, determine whether the data obtained was reliable and could be used in the main experiment. Finally, the surplus variable in the experimental environment of the preliminary experiment was removed to create an experimental environment that focused on the objective variable, the number of people in the audience.

In a preliminary experiment, 12 experimental participants were classified into two groups, one without audience and the other with audience, according to the Interpersonal Anxiety Scale, to investigate the difference in anxiety state depending on the presence of a virtual audience.

As a result, differences in STAI (A-State), blood pressure, and pulse rate were confirmed in the overall anxiety fluctuation between the groups with and without the speech task. However, during the speech devising phase, there was a difference in anxiety variability between the two groups, suggesting that the speech task was inappropriate. The luminance factor was also unclear during the speech practice phase. Furthermore, the venue and the avatar used in the experiment also showed some problems, and further improvement is desirable in this experiment.

This experiment was conducted with 18 participants. The participants were divided into three conditions according to the Personal Report of Confidence as a Speaker (PRCS): no audience (Group A), one audience (Group B), and five audience (Group C). The experiment was conducted in the following order: explanation of the experiment, speech structure development, speech practice, performance, and reflection report. The participants wore HMDs only during the speech practice phase, and a subjective questionnaire was administered at the end of each phase.

The results partially supported hypothesis **【I】**. Overall, the subjective psychological load did not show a fixed variation with the increase in the number of virtual audience members. Different changes were observed in the subjective questionnaire to state anxiety and nervousness after the speech practice and after the actual performance. This indicates that the psychological load does not increase monotonically with the increase in the number of participants in the subjective evaluation.

Hypothesis **【II】** was not supported. In the absence of a virtual audience, physiological psychological load showed a decreasing trend. However, when there was only one virtual audience, physiological psychological load tended to increase with time, but no correlation was observed in the 5-people virtual audience condition. 5-people virtual audience condition showed persistent anxiety, resulting in both sympathetic and parasympathetic nervous system hyperactivity and no physiological response.

Hypothesis **【III】** was not supported. 1-person virtual audience condition had the lowest self-rating and the highest peer rating. In the five-person audience condition, persistent anxiety was considered to decrease performance. In addition, VR practice was not effective in the no virtual audience condition, indicating that the results were dependent on the individual's original ability.

In this study, the hypothesis was not supported, but some relationship was found between the number of virtual audience members and the psychological load of the presenter. This result contributes to the clarification of speech anxiety. In addition, the acquired pupil diameter data and gaze data will be useful information for future research on speech support using VR. However, there are still various issues to be solved, such as the inadequacy of the experimental environment and the number of subjects, so further improvement and additional verification are needed in the future.